

WILD RICE
(*Zizania Aquatica*)



SASK. GOV'T PHOTO.

WILD RICE IDENTIFICATION and PROPAGATION
in
NORTHERN SASKATCHEWAN

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WILD RICE - IDENTIFICATION AND PROPAGATION IN NORTHERN SASKATCHEWAN.

INTRODUCTION

Wild rice, (*Zizania aquatica*) is a tall, grass-like aquatic plant growing in marshes, shallow lakes, and along the borders of sluggish streams. It is an annual that grows from seed each year, the same way as oats, barley or wheat. It resembles cultivated rice by virtue of the fact that it grows in shallow water. Here the resemblance stops because it is not the ancestor of cultivated rice and is related to it only about as closely as oats is to corn. The closest relative of our wild rice is a wild rice of Manchuria and North-eastern Asia.

The crop has grown for many years in Wisconsin, Minnesota, Manitoba and the Eastern United States. Total over-all production is small, the largest producer probably being Minnesota with an average annual production of about 600,000 pounds of finished rice. Traditionally, wild rice has been harvested for food and market by Indian peoples who used the hand harvesting method. Most states and provinces have attempted to maintain this tradition through regulations. In some instances however, harvesting machines are used where Indian labour is not available.

In addition to it's commercial value as a food crop, wild rice is very valuable as a wildlife food. Muskrats, an important fur bearer of Northern Saskatchewan, thrive on it from June, when it comes through the water, until freeze up when they store away its stocks and roots. Water fowl use it during late summer and fall for cover and for food. Rice stands in Canada and the States are favorite hunting spots during the southern migration of ducks. Commercially, whole wild rice seed is used in wild game dressings and in the preparation of exotic foods. It is also being used in pancake mixes and muffin mixes, along with other ground grains. Due to its short supply and consequent high price in the prepared state, it has not come into general use as a food. Each wild rice grain when it is harvested, is rather soft and is enclosed in a tight clinging hull. Before it can be used

for food it must be heated or parched so that the hull can be removed by rubbing. Commercially this is done with parchers, hullers and cleaners. It's main attraction as a culinary delicacy is the nutty and somewhat gamey flavor of the parched grain. Wild rice should not be boiled. Pour boiling water over it and let it steep until the water cools. Do this four times and each grain will come out tender and separate, ready for use in either dressing or as a side dish.

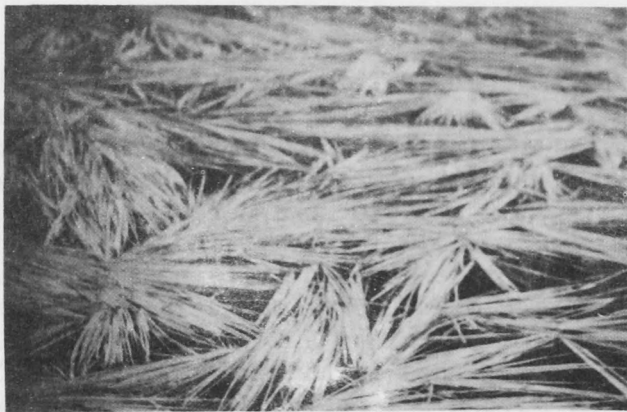
In Northern Saskatchewan, four locations are known to be producing wild rice in blocks that could be considered to be of commercial size. These locations are Limestone Lake, Potato Lake, Pine River and Nemeiben Lake. In three of these it is known that wild rice did not originally grow but was planted there in 1935 as part of a planting experiment.

IDENTIFICATION OF WILD RICE STANDS

The wild rice plant germinates in the spring from a seed on the lake bottom. It grows in reddish colored, muskeggy water that is from 6 to 54 inches in depth. The plant seems to do best in a deep muck bottom 18 inches or more in depth with the result that it has an extremely weak root system in it's early stages of growth. By late June most plants have emerged from the water and can be identified by clusters of narrow, ribbon-like floating leaves.

Wild Rice in mid-June,
showing dense floating
leaves.

Photo by:
J. D. Neilson.



These leaves lie flat on the water. Probably the best way of

describing a field of wild rice at this time is to state that it looks like a green slime covering the water, made up of dense masses of elongated, narrow, ribbon-like floating leaves that are from $1/8$ to $1/4$ inch in width. The plant will not compete with reeds and rushes, and as a result is always to be found growing outside the reed line.



View of Wild Rice area in mid-June. Note distinctive reed line in background. The wild rice in the foreground makes a green covering on the water. Wild rice always grows outside the reed line and not among the reeds and grasses.

Photo by:
J. D. Neilson.

It is in this period of growth that the survival of the plant is most severely threatened. Sharp rises in water level can smother the floating leaves, killing the plants. Likewise, high winds and waves can pull the plants from their poorly anchored roots. Consequently, wild rice is more likely to be found in small wind-protected bays of lakes that are fed by muskeg creeks, slow moving rivers that are not subject to greater than normal spring flood, and mucky bottomed small lakes where there is some water movement. It is unlikely to survive in large clear water lakes fed by relatively large streams that arise from large watersheds and are subject to periods of extremely high spring flooding.

By mid and late July the plant has grown and developed. Some of the leaves have started to stand up out of the water and flowering stalks have appeared, that stand about 24 inches out of the water. Leaves by this time are about $7/16$ of an inch in width and a definite firm underwater stem has developed with nodes. New roots have started to develop from nodes that are just above ground level and have pushed down into the mucky

bottom to give the plant greater support. Often a plant may "stool" and produce several flowering stalks. The wild rice spike or head which tops each stalk is separated into two parts. The female flowers that eventually become the grains are crowded into the gray-white spike at the top of the stalk. The small reddish-purple colored male flowers with their yellow pollen centres, are on fine spreading branches immediately below the female spike.



Close up picture of Wild Rice in mid-July. The tall spikes which stand out in the photo show grayish female flowers at top, with reddish-purple male flowers on fine spreading branches immediately below spikes.

Photo by:
J. D. Neilson

It is of interest to note that the female flowers bloom very shortly after emerging from the water and thus have to be fertilized by pollen from the male flowers of other rice plants, since the male flowers of the particular plant have not yet bloomed. In this way, cross-fertilization is assured. To look from a distance at a field of wild rice in late July, is very much like looking at a field of stooling oats that is growing on the water. The flowering stalks are generally fairly invisible except at close range.

The general height of plant growth above the water is not high, and the reed line at the outer boundary of the area is still clearly discernible.



View of Wild Rice area in mid-July.
Note reed line still visible in
background. The rice is now upright.
Area looks like a field of "stooling"
oats.

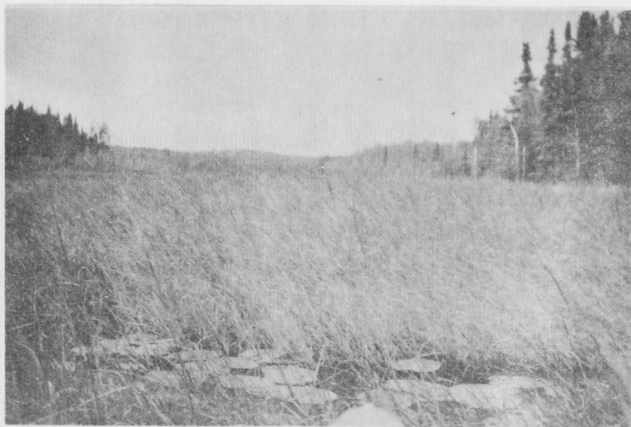
Photo by:
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By late August, the crop is in the process of maturing. Coarse straw stems extend anywhere from 2 feet to 8 feet out of the water and are upright, unless they have been subject to heavy wind, in which case the shorter stems may be bent over in one direction. The gray-white spikes at the top of the flowering stems have now filled with the black and green wild rice seeds. Ripening of the filled seed spike takes place from the top down, giving a field of wild rice a generally purplish look. The crop may be dense and difficult to get through with a canoe. Reed lines are no longer discernible.

Generally, except for the purplish top color, the crop from a distance looks somewhat like a heavy crop of oats, except that the heads are spikes and in the main are not panicle out.

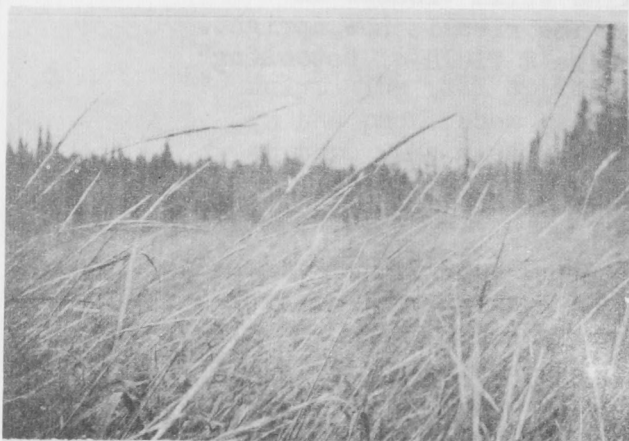
View of Wild Rice in late August, ready for harvesting. Note dense growth and association with water lilies. Reed line in background is no longer discernible.

Photo by:
J. D. Neilson.



Close up of Wild Rice ready for harvesting in late August. Note dense growth and long spikes filled with Wild Rice seed. Height above water varies from 2 feet to 8 feet.

Photo by:
J. D. Neilson.



IDENTIFICATION OF SUITABLE AREAS FOR PROPAGATION

One way of identifying areas suitable for the propagation of wild rice is the close observation of areas where wild rice is presently growing in Saskatchewan, some 28 years since it was first seeded. A second method is by experiment with small quantities, particularly in small northern sloughs with mucky bottoms where conditions appear right.

Wild rice grows in a muck bottom that usually overlays a solid bottom with at least 18 inches of muck. It will not compete well with weeds and grows in rust colored (muskeg) water that is from 6 inches to $4\frac{1}{2}$ feet in depth. It is usually found growing in association with water lilies. If these are not present it is suggested that salinity of the water may be too high to permit growth. It is extremely sensitive to wave action and flash flooding in June, that can drown it out. The Pre-Cambrian region and lakes within a 50 or 60 mile distance from it, seems to be the most suitable area for wild rice growth. The crop seems to do best in locations where a slight water movement takes place during the spring of the year.

It follows that the above conditions are what should be looked for when contemplating the planting of wild rice seed. During 1962 some experimental work was carried out in planting small quantities of wild rice seed in small northern sloughs with little or no outlet. This seed germinated and grew well in 1963. Information pertaining to the propagation of wild rice is not extensive. It may well be that there is enough spring water movement in these small northern sloughs, other conditions being right, to permit the right oxygen content of water for seed germination. More experience is necessary before seeding in small still sloughs can be recommended, though it could be tried.

In general, muskeg fed bays of smaller northern lakes that are not subject to extreme high water conditions, small slow flowing rivers that take their rise from muskegs and narrows between northern lakes, would appear to be the most favored places for the growing of wild rice. The other conditions, such as mucky bottoms, association of water lilies, wind protection, rusty colored water, etc. are also very

important features that would appear to be necessary. Another important factor would be that of having sufficient area of water of the correct depth outside of the reed line and free of weeds, to permit a sizeable area of wild rice growth.

Wild rice loses its ability to germinate (viability) if it is allowed to dry out. Therefore if it is to be used for seeding purposes, it must be either seeded immediately following harvest or kept moist in cool conditions, by sinking it in bags into water immediately following harvest. In northern Saskatchewan the latter practice has been followed, the rice being kept in water in good condition for as much as six weeks following harvest.

Fall seeding of wild rice would appear to be the better practice to follow. While the crop could be seeded in the early spring, there are definite advantages in fall seeding. It is much easier to move on northern streams and lakes in September and October than it is during spring break up. Under natural conditions, the crop shatters its seed into water at harvest time with this seed going to the bottom of the lake and germinating in following years. One caution - seed to be stored in water for later fall seeding should be stored in tight cotton bags. The hulled wild rice seed has characteristics similar to the seed of a wild oat and will crawl right through the jute bags.

Wild rice seed is usually broadcast by hand behind an idling outboard motor canoe or one propelled by hand. It should be seeded for new stands in water that is about 18 inches deep. While its range of growth is from 6 inches to $4\frac{1}{2}$ feet, shallow seeding could entail problems of bottom freezing while deep seeding could result in spindly spring growth. The seeding rate is about 20 pounds per acre. About 3 acres should be the minimum area seeded at a new seeding. On small test stands it has been difficult to get seed to mature in the year following seeding, due to damage by ducks and other waterfowl. It is possible for these birds to push entire small stands into the water, thus wiping out the seed shattering process and precluding further natural seeding. In such instances no further wild rice can grow. Therefore, areas of new seeding should be large enough that this problem is not likely to occur.

On most newly seeded stands, natural propagation by seed shattering is depended upon to increase the size of the stand to the point where it can be used commercially. It is possible, however, to increase size of stands by further reseedling. In these cases depth of water for seeding becomes of little consequence as long as it is within the depth range of the wild rice plant.

HARVESTING AND SEED HANDLING

Harvest time for wild rice in Saskatchewan, takes place anytime between August 20 to September 15, depending on the season. Knowing when to start harvesting this crop is very important. Much valuable seed can be lost if it is delayed too long. Likewise, damage can be done to the "too green" kernels of the crop if it is started too early. The whole crop is subject to natural hazards at harvest time. A high wind or driving rain at the time when rice is ready for harvest, can shatter most of the rice that otherwise would have been harvested at that time.

The spikes or heads of wild rice ripen from the top down. This can be noticed by the distinctive purplish coloring that shows through the hulls on each seed. It is usually considered time to start harvesting when the average of the spikes are purplish in color, about $\frac{1}{3}$ of the way down from the top of the spikes. Another way of determining time to harvest, is by checking the kernels of rice inside the hulls. If these green kernels (they turn black when ripe) are fairly firm and there are ripened (black) kernels on the top of the spike, then harvesting can commence.

Harvesting by the hand harvesting method is accomplished by the use of small canoes, not more than 16 feet in length and having a maximum width of not more than 36 inches. Paddles are used if the crop is not too heavy to get through. If it is too heavy, then long poles, forked at one end, are used to pole the canoe through the thick stands. Two men are employed in each canoe. If paddles are used, the paddler is stationed in the front of the canoe with the harvester in the rear. If poles are used, the poler is stationed in the rear of the canoe with the harvester located near the centre. Each

harvester is equipped with two rice sticks or flails. These are simply tapered light sticks about 24 inches in length. With a stick in each hand the harvester simply brings the rice stalks over the canoe with one stick and gently taps or flails the rice heads with the other. Rice that is ready to harvest will shatter into the bottom of the canoe. It is important in harvesting that harvesters do not beat and batter the rice stalks on the first harvest since they may be damaged for the second and third harvest.



Harvesting Wild Rice by hand method. Rice is brought over canoe with one stick and gently tapped with the other. Seed shatters easily into bottom of canoe.

Photo by:
J. D. Neilson.

Since wild rice does not ripen evenly and since it shatters into the water almost as soon as it is ripe, it is necessary to harvest a field at least three and sometimes four times in one harvest season, to get the best returns. Given reasonably warm days, these harvests usually take place at 4 or 5 day intervals (i.e. the crop is harvested and then let stand

for 4 days then harvested the second time, etc.) Usually the largest return comes from the second harvesting, because it is during this period that the largest portion of the wild rice spikes have ripened with consequently greater shattering into canoes taking place.

Most harvesting up to the present time has been done by the hand method. There have been large barge type machines developed for harvesting purposes, but they have been relatively large and not suitable for transportation. More recently, a light type 8 foot machine that can be mounted on a narrow, flat-bottomed boat, has been developed. This machine is still in the experimental stages and if successful, would be easily transportable by aircraft.

If suitable machines can be developed they will have their place in the harvesting of rice, even though production may be aimed at giving work to native harvesters. In many years the wild rice crop can be too thin and not high enough above the water to permit efficient harvesting by the hand method. In such circumstances, machines can be used to harvest crops that would otherwise go to waste.

Yields per acre of wild rice vary with crop conditions. Under average conditions, the yield per acre of green rice harvested by the hand harvesting method will be from 100 to 200 pounds per acre. This represents only about 1/5 of the total crop, the balance being lost by shattering into the water. It seems probable that machine harvesting would be more efficient and greater yields than this would likely be attained. However, present strains of rice depend on shattering to maintain their existence, so care would have to be exercised to see that some seed was allowed to shatter even with machine harvesting.

Wild rice when harvested is enclosed in tight green hulls. It will therefore heat very easily if left unattended in piles or bags. Unless it can be shipped to processors immediately after harvesting, it should be spread on a floor to a depth not greater than 30 inches and turned daily until it can be bagged and shipped in order to prevent it from heating. Good ventilation is necessary where this is being done.

Good long wild rice seed or lake rice, as it is known, will yield about 50 percent or better of its green weight as processed grain (that is, 100 pounds green weight would yield 50 pounds of finished rice). Short wild rice or river rice, as it is known, may yield only 40 percent. Most wild rice is purchased in its green state directly from the harvesters. Prices vary with supply and demand conditions and usually vary from 25¢ to 60¢ per pound for green rice; finished rice prices varying from 90¢ to \$2.00 per pound. Most reputable processors will make allowance on the basis of moisture content for rice that has been held in good condition for a week or so before shipping. Green wild rice loses weight rapidly as it dries, following harvest. It should be shipped in tight cotton bags.

There are no present markets for wild rice in Saskatchewan due to low production. Buyers and processors in Manitoba and Minnesota are probably the closest market for our production. As production of the crop increases there is little doubt that a market will be established in Saskatchewan since commercial demand for the product is quite keen.

The handling of green wild rice for seed purposes is rather difficult. It must not be allowed to dry or else the ability to germinate will be lost. It is therefore necessary to immerse bags of green rice in cool water immediately following harvest. It must be kept moist until such time as it is seeded. If seeding is to be done adjacent to the point of harvesting, such seeding can be done immediately following harvest and no immersing will be necessary.

GENERAL OBSERVATIONS

Wild rice has few serious pests. Occasional grains may be infected with ergot (a fungus disease of grains). There is also a kind of army worm which sometimes feeds on the ripening rice. Blackbirds can also be a pest of the crop and denude sizeable areas if they are in large numbers. As previously mentioned, muskrats and ducks also find it a preferred food.

In some ways wild rice bears a very close resemblance to wild oats. The hulled seed will move along a floor or

through a jute bag as will a wild oat seed. When a crop is completely drowned out in one year, it may easily come up and produce a good crop in the same place the following year. This characteristic has confused many people into thinking that wild rice is a perennial. It is not however, and it may well be that the long dormancy characteristics of wild oat seeds are also prevalent in wild rice seeds. If such were the case, ungerminated wild rice seeds could lie dormant in the lake bottom for more than one year with germination taking place when conditions for the particular seed were right. This would explain the recurrence of good crops following complete crop failures.

Wild rice production in Saskatchewan is in its infancy. In Manitoba, larger scale commercial production has only been taking place for about 15 years. Unsuccessful attempts have been made in the United States to grow the crop on marshlands that can be flooded. Wild rice is rather choosy as to the conditions under which it will grow successfully. Such characteristics of the crop do not preclude the possibility that in future years non-shattering strains can be developed by plant breeders. Such a development would change the whole present method of harvesting. The crop would then have to be cut from the water surface and be harvested in a similar manner to other grain crops after a drying period.

Few people in Saskatchewan know what wild rice looks like. The foregoing paper has been written in the hope that it may help interested persons in the identification of wild rice when they see it and more particularly to help them to identify areas in northern Saskatchewan that would be suitable for the propagation of wild rice. No attempt has been made to go into scientific data concerning the crop and common wording has been used wherever possible. Uses of the crop and harvesting methods have been described mainly to round out the picture of the crop as a whole and its potentials both as a commercial crop and as a wildlife food.

